

Exhibit G

Special Information and Insider Trading

I. INTRODUCTION

Trading by corporate officers, directors, and large stockholders, who are commonly called insiders, commands widespread attention in the financial community. Academicians are interested in the amount of special information insiders possess, as well as in the profit they earn from such knowledge. The average investor seeks out useful information in the *Official Summary of Insider Trading*,¹ the monthly report listing the transactions of corporate officials.

Previous research on corporate insiders has focused on the profitability of their trading. Some researchers, examining months of intensive insider activity, have concluded that insiders can predict stock price movement up to 6 months subsequent to trading. Rogoff for example, examines 45 companies in which, within a single month, three or more insiders buy their company's stock and no insiders sell the stock.² He finds that the returns to the insiders of these companies in the following 6 months are on average 9½ percent greater than the return to the stock market as a whole.

Glass examines 14 different calendar months and selects the eight securities with the greatest excess of buyers to sellers among insiders within a month.³ He finds that the average return on these securities is 10 percent above the return on the stock market as a whole in the 7 months following the individual months of intensive buying.

Lorie and Niederhoffer investigate stock performance following months in which there are at least two more buyers than sellers or at least two more sellers than buyers among the insiders of a company.⁴ They find that a security experiencing an intensive buying month is more likely to advance than to decline relative to the market in the 6 months subsequent to the event. Conversely, a security experiencing an intensive selling month is more likely to decline than to advance relative to the market in the 6 months subsequent to the event.

Driscoll examines the trading by insiders prior to dividend changes

* University of Pennsylvania. I wish to thank my dissertation committee: Merton Miller (chairman), Fischer Black, and Eugene Fama, who guided me in this area of research. I also wish to thank the members of the Finance Workshop at the University of Chicago, especially G. Mandelker and R. Ibbotson.

1. U.S., Securities and Exchange Commission, *Official Summary of Security Transactions and Holdings* (Washington, D.C.: Government Printing Office).

2. Donald L. Rogoff, "The Forecasting Properties of Insider Transactions" (D.B.A. thesis, Michigan State University, 1964).

3. Gary S. Glass, "Extensive Insider Accumulation as an Indicator of Near Term Stock Price Performance" (Ph.D. diss., Ohio State University, 1966).

4. James H. Lorie and Victor Niederhoffer, "Predictive and Statistical Properties of Insider Trading," *Journal of Law and Economics* 11 (April 1968): 35-51.

and finds that insiders actually buy more stock than they sell in the 6 months prior to dividend decreases.⁵ He concludes that the evidence does not suggest any noticeable speculative interest of insiders with respect to unfavorable dividend action.

Wu classifies months of insider trading in specific securities as either net buying or net selling months.⁶ Studying the price movement of these securities in the month following the month of trading, he concludes that there is no relationship between insider trading and subsequent stock price movement.

Scholes investigates secondary offerings, many of which are issued by insiders,⁷ and finds that the residuals of securities decline an average of 1 percent on the days of these offerings.⁸ He rejects the hypothesis that the residuals fall because of selling pressure and concludes that the drop in residuals is due to the market's belief that the issuer possesses inside information of an adverse nature.

In summary, the evidence with respect to the profitability of insider trading is not clear-cut. On the one hand, Rogoff, Glass, and Lorie-Niederhoffer find evidence that insiders can predict price movements in their own securities as much as 6 months in the future. On the other hand, Scholes's results suggest that residuals drop on the day of the secondary distribution with no further systematic changes. Both Wu and Driscoll find no evidence of successful forecasting by insiders. Furthermore, some of the studies are outdated. A few of the studies employ small samples, while others ignore transaction costs, the relative risk of different securities, and general market conditions. This paper attempts to improve on the older and less efficient techniques, and, in the process, to resolve the existing differences of opinion.

Another objective of this paper is to test the information content of the *Official Summary*. Though the publication was established in 1934, little research has been conducted on it. Of the research summarized above, only the Lorie-Niederhoffer study examines the returns to securities following publication of the *Official Summary*. As noted earlier, they conclude that a security experiencing an intensive buying event is more likely to advance than to decline relative to the market following publication of the event in the *Official Summary*. Conversely, a security experiencing an intensive selling event is more likely to decline than to advance relative to the market following publication of the event. The

5. Thomas E. Driscoll, "Some Aspects of Corporate Insider Stock Holdings and Trading under Section 16b of Securities and Exchange Act of 1934" (M.B.A. thesis, University of Pennsylvania, 1956).

6. Hsiu K. Wu, "Corporate Insider Trading Profitability and Stock Price Movement" (Ph.D. diss., University of Pennsylvania, 1963).

7. Myron S. Scholes, "The Market for Securities: Substitution versus Price Pressure and the Effects of Information on Share Price," *Journal of Business* 45 (April 1972): 179-211.

8. The calculation of residuals is explained later in this study. For the present, residuals can be viewed as the changes in a stock price not explained by the movement of stock prices in the market as a whole.

authors state: "This study indicates that proper and prompt analysis of data on insider trading can be profitable."⁹

This conclusion conflicts with the considerable body of research suggesting that stock prices fully reflect all publicly available information.¹⁰ To resolve this issue, the present study reexamines the information content of the publication.

II. INSIDER TRADING CHARACTERISTICS AND PROBLEMS OF MEASUREMENT

As part of this study, a random sample of trading months was drawn covering 200 large firms in the period 1962-68. This will be referred to as the "initial sample," and methods of drawing it will be described in more detail in Section IV. Based on this sample and the *Official Summary of Insider Trading*, descriptive statistics of the size, direction, etc., of insider trades are presented in tables 1 and 2.

The sample covers trades in approximately 1,000 firm-months. In some of these, there were no insider transactions. In some others, there were more than one purchase, sale, or a combination of these.

The tables show that the number of purchases is slightly greater than the number of sales, and the average purchase size is slightly greater than the average sale size. The variability in the size of transactions is large.

The distribution is skewed to the right. While approximately 40 percent of the transactions involve less than \$10,000, many transactions involve over \$100,000, and a few outliers involve over \$1 million.

Of the three main groups of insiders, officers trade most frequently, though their average size of trade is the smallest. The differences among the trading patterns of the three groups is slight relative to the variability in the sample as a whole.

The price behavior of stocks of firms traded by insiders, like that of stocks in general, reflects a variety of market-wide, industry-wide, special, and "random" influences which must somehow be recognized in any effort at isolating the relationship between price and insider trading activity. Beyond this, the phenomenon of insider trading raises certain special problems of which a researcher must be aware.

Since brokerage commissions are approximately 1 percent per

9. Lorie and Niederhoffer, p. 52.

10. For a general review of the literature, see Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance* 25 (May 1970): 383-417. The following are individual studies dealing with publicly available information: Eugene F. Fama et al., "Adjustment of Stock Prices," *International Economic Review* 10 (February 1969): 1-21; Ray Ball and Philip Brown, "An Empirical Evaluation of Accounting Income Numbers," *Journal of Accountancy Research* 6 (Autumn 1968): 159-78; Gershon Mandelker, "Returns to Stockholders from Mergers" (Ph.D. diss., University of Chicago, 1973); Roger Ibbotson, "The Performance of New Issues" (unpublished manuscript, University of Chicago, 1973).

Table 1
 Frequency Distribution of Size of Insider Trades
 (Based on Initial Sample)

Size*	Frequency	
	Purchases	Sales
Below 0.1	0	1
0.1-1	13	0
1-10	222	165
11-20	84	97
21-30	46	62
31-40	29	25
41-50	17	26
51-60	11	23
61-70	10	22
71-80	4	11
81-90	4	6
91-100	3	4
101-200	9	32
201-300	6	4
301-1,000	6	8
1,001 and over	2	0
Total	466	486

* In thousands of dollars.

transaction on a round lot sale, an insider must expect the return on his company's security to be at least 2 percent greater than the return on securities of comparable risk before it will be worthwhile for the insider to undertake a "round-trip" transaction in his company's security. As a result, insiders may not trade on special information that leads only to stock price movement on the order of transaction costs.

Recent developments in security regulation which have increased the probability that an insider will be prosecuted for trading on inside information may deter insiders from trading. In addition, under Section 16(b) of the Securities and Exchange Act of 1933-34, insiders must return all profits from a purchase and subsequent sale (or a sale and a subsequent purchase) occurring within 6 months of each other. Therefore, an insider must be prepared to retain his new acquisitions for at least 6 months in order to profit from his inside information.

Statistical noise may increase the difficulty of detecting successful

Table 2
 Breakdown of Insider Trades by Type of
 Transaction (Based on Initial Sample)

Type of Transactor	Total Number of Trades	Number of Purchases	Number of Sales	Average Size of Purchase (in \$)	Average Size of Sale (in \$)
All transactors	952	466	486	32,905	38,517
Directors	306	174	132	47,346	37,019
Officers	391	167	224	22,013	37,350
Officer-Directors	255	125	130	27,306	42,063

exploitation of special information. Many insiders presumably transact for reasons other than to profit from special information. Residuals following their trades should be distributed randomly about zero. In addition, insiders may purposely trade without information to camouflage trading based on special information.

Insider gains may also be masked by "gamesmanship." When rational investors learn of a purchase by a knowledgeable insider, they should bid up the price of the stock to reflect this fact. A shrewd insider without information can capitalize on the market's belief in the special knowledge of all insiders by buying shares in his company at any time. Outsiders, learning of this transaction, should bid up the stock price, allowing the insider to sell what he bought at the now higher price. The reverse can occur for selling. Hence, if the market cannot differentiate an insider with information from an insider without information, in the limit shrewd but not otherwise knowledgeable insiders can transact until they force the average price change after all insiders' trades to zero. This will also camouflage trading with information.¹¹

While transaction costs and regulatory restraints tend to reduce the profitability of trading by nonknowledgeable insiders, they may not eliminate it entirely. For example, if transaction costs are 1 percent per transaction, nonknowledgeable insiders can confine the average price change after purchases to not more than 2 percent. Insiders can avoid Section 16(b) by allowing friends, relatives, or insiders of other firms—all of whom are free to sell within 6 months without penalty—to purchase at the same time that insiders purchase.

Some of these phenomena may act to camouflage the gains from trading on inside information. To see if this is so, and in an effort to minimize their effect, this study makes use of additional samples limited to large trades or to months where there is an especially great preponderance of trades in a single direction. These circumstances, it is hoped, are most likely to be free of the effects of noise, gamesmanship, etc.

III. METHODOLOGY

Calculation of Residual

In order to estimate the profitability of insider trades, this study examines the performance of a security subsequent to specific types of insider trades in that security, which we call insider trading events.¹²

Sharpe and Lintner have developed a model of equilibrium pricing

11. The argument assumes that all insiders can trade with anonymity. For example, this method of profiting could not be applied to secondary issues where, as suggested in Scholes, the price is depressed during, as well as after, the transaction.

12. Three types of insider trading events are examined: (1) a transaction of an insider, (2) a large transaction of an insider, (3) a month in which many insiders of a company transact. Precise specification of these events are presented later.

of risky capital assets.¹³ This model postulates a linear relationship between the expected return on a security and the covariance of the security's return with the return on a portfolio composed of all securities in the market (commonly called the "market portfolio").

The following is a model of the stochastic process generating period-by-period returns that is consistent with the two-parameter model of Sharpe and Lintner and that has empirically been found to provide a good representation of actual returns:¹⁴

$$R_{jt} = \tilde{\gamma}_{0t} + \tilde{\gamma}_{1t} \beta_j + \tilde{e}_{jt}, \quad (1)$$

where \tilde{R}_{jt} = rate of return on security j during period t ; \tilde{R}_{mt} = rate of return on the portfolio of all assets in period t ; β_j = the ratio of the covariance between \tilde{R}_{jt} and \tilde{R}_{mt} to the variance of \tilde{R}_{mt} (β_j is proportional to the contribution of the j th security to the risk of the market portfolio; it is a measure of the relative risk of the j th security, as compared to the risk of the market portfolio); $\tilde{\gamma}_{0t}$, $\tilde{\gamma}_{1t}$ = market-determined parameters showing the ex post relationship between risk and return in different time periods; \tilde{e}_{jt} = the disturbance of the j th security at time t .

Equation (1) indicates that the return on a security in period t is a function of the disturbance, \tilde{e}_{jt} , which is specific to an individual security, as well as the market-wide variables, $\tilde{\gamma}_{0t}$, and $\tilde{\gamma}_{1t}$. The disturbance in equation (1) can serve as a measure of the abnormal performance of a security, since the effects of $\tilde{\gamma}_{0t}$, $\tilde{\gamma}_{1t}$, and β_j are netted out. Since it is assumed that insiders possess more special information concerning their own security than concerning the market as a whole, this study examines the residuals of securities subsequent to insider trading events. As the estimation of $\tilde{\gamma}_{0t}$ and $\tilde{\gamma}_{1t}$ for each month is needed to measure a security's disturbance in equation (1), this study uses the estimates of $\tilde{\gamma}_{0t}$ and $\tilde{\gamma}_{1t}$ derived in the Fama and MacBeth paper.¹⁵

Statistical Measurements

Based on information gathered from the *Official Summary of Insider Trading*, samples are chosen consisting of securities undergoing a specific insider trading event. Examples of events are listed above. To estimate and interpret the gains from insider trading, residuals subsequent to events are examined. This section presents methods for estimating both the magnitudes of the residuals, and the likelihood that residuals of that magnitude might have arisen purely by chance.

13. William F. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk," *Journal of Finance* 19 (September 1964): 425-42; John Lintner, "Security Prices, Risk, and Maximal Gains from Diversification," *Journal of Finance* 20 (December 1965): 587-615.

14. See Fischer Black, Michael Jensen, and Myron Scholes, "The Capital Asset Pricing Model: Some Empirical Results," in *Studies in the Theory of Capital Markets*, ed. Michael Jensen (New York: Praeger Publishers, 1972); and Eugene Fama and James MacBeth, "Risk, Return, and Equilibrium: Some Empirical Tests," *Journal of Political Economy* 81 (May/June 1973): 607-36.

15. Fama and MacBeth.

Procedure for Estimating Magnitude of Residuals

Assume that a sample is chosen consisting of securities with trading events occurring over a certain period of time. We define U_m , the mean residual over all securities in the sample for month m , as:

$$U_m = \frac{\sum_{j=1}^N \hat{U}_{j,m}}{N} H_j, \quad (2)$$

where N = number of securities in the sample; $\hat{U}_{j,m}$ = estimated residual for security j in month m (month 0 in eq. [2] is the month of the event, while month 1 is the following month, and so on); $H_j = 1$, if the event of the i th security is a purchase or set of purchases; and $= -1$, if the event is a sale or set of sales.

Next, define the cumulative average residual, CU_m , as:

$$CU_m = \sum_{k=-15}^m U_k. \quad (2')$$

Tests of Significance

Again, we assume that a sample is chosen consisting of companies with insider trading events over a certain period of time. We want to form a test statistic indicating whether residuals subsequent to trading events are statistically larger than zero. The following six steps describe a method of forming such a one-sided test statistic.

1. *Formation of portfolios.*—Let X represent a specified integer. A portfolio corresponding to month t is formed by including the securities of all companies with events between and including month $t-X$ and month t . As there is one and only one portfolio per calendar month for each value of X , the portfolio corresponding to month t is called portfolio t .¹⁶ If a company has events in c different months during the period from month $(t-X)$ to month t , it is included c times in portfolio t .

For example, if X equals one, the portfolio of June 1962 includes all companies with events in either May or June 1962. If a company has events in both May and June 1962, it is included twice in the portfolio of June 1962. Similarly, when X equals two, the portfolio of May 1962 includes all companies with events in either March, April, or May 1962. If a company has events in both April and May 1962, it is included twice in the portfolio of May 1962.

In this study X assumes the values of zero, one, and seven. These correspond to periods of 1, 2, and 8 months within which occurrence of an insider trading event will lead to the inclusion of corresponding security in a portfolio.

16. If there are no events between month $(t-X)$ and month t , portfolio t will contain no securities. As will be seen later, portfolios that contain no securities are ignored in statistical tests.

2. *Measurement of performance of a portfolio.*—Next, the performance of portfolio t in the month from t to $t + 1$, which we call month $t + 1$, is defined as follows:

$$\hat{e}_{t,t+1} = \frac{\sum_{i=1}^S (\hat{e}_{i,t+1} H_i)}{S}, \quad (3)$$

where $\hat{e}_{t,t+1}$ = residual of portfolio t in month $t + 1$; $\hat{e}_{i,t+1}$ = residual of the i th security of portfolio t in month $t + 1$ (as opposed to notation in [2], month $t + 1$ is a calendar month and not a period of time relative to the date of a trading event); S = number of securities in portfolio t ; $H_i = 1$, if the event of the i th security is a purchase or set of purchases; $= -1$, if the event is a sale or set of sales.

3. *Measurement of variability of a portfolio's performance.*—A measure of the variability of the performance of portfolio t , called \widehat{SD}_t , is defined as the computed standard deviation of the residual of portfolio t , using data during the period from month $(t - 49)$ to month t . This can be written as:

$$\widehat{SD}_t = \sqrt{\frac{1}{49} \sum_{j=1}^{50} (\hat{e}_{t,t-j+1} - \frac{1}{50} \sum_{i=1}^{50} \hat{e}_{t,t-i+1})^2}$$

4. *Standardization of a portfolio's performance.*—We define $\widehat{s}e_{t,t+1}$ to be the standardized residual for portfolio t at time $t + 1$. It is expressed as:

$$\widehat{s}e_{t,t+1} = \frac{\hat{e}_{t,t+1}}{\widehat{SD}_t}. \quad (4)$$

5. *Measurement of standardized performance across all portfolios.*—As a different portfolio is formed for each calendar month, for a given value of X , portfolio t is just one of many portfolios. The average standardized residual across all of these portfolios, called $\overline{s}r$, is defined as:

$$\overline{s}r = \frac{1}{n} \sum_{t=51}^{401} \widehat{s}e_{t,t+1} D_t, \quad (5)$$

where $D_t = 1$, when there is at least one security in portfolio t , $= 0$, when there are no securities in portfolio t ; n = number of months in which the portfolio corresponding to the month has at least one security.

$$n = \sum_{t=51}^{401} D_t. \quad (6)$$

As $\hat{\gamma}_{0t}$ and $\hat{\gamma}_{1t}$ are calculated from January 1935 to June 1968, month 1 is January 1935, and month 402 is June 1968. In equations (5) and (6), t begins at 51 because 50 months of past data are required to estimate a portfolio's residual variance. Similarly, month 402 is omitted in equations (5) and (6) as 1 month of future data is required to calculate $\hat{s}_{\epsilon,t+1}$.

6. *Calculation of t-test.*—The following equation tests whether \overline{sr} is significantly different from zero:¹⁷

$$t = \frac{\overline{sr}}{s/\sqrt{n}}, \quad (7)$$

where s = estimate of standard deviation of each standardized portfolio. This value is constrained to be one due to the standardization process. Since in this study, X assumes the values of zero, one, and seven, there are three sets of portfolios, one for each value of X . The six steps outlined above are repeated for each value of X , yielding three t -statistics. This approach is referred to henceforth as the "portfolio method."

Rationale for Methodology

Though the two-factor model of equation (1) removes much residual correlation, other phenomena, such as common industry effects, can cause residuals across securities in a given month to be correlated. Consequently, a test statistic should not assume independence of residuals across securities in a given month. The test statistic of equation (7) measures a portfolio's residual variance directly, thus taking account of the correlation between residuals of different securities in a given month.

For samples of insider trading to be presented later, the serial correlation of standardized residuals across portfolios was measured. As the null hypothesis that the serial correlation is zero could not be rejected, the individual standardized residuals can be treated as independent observations in equation (7).

IV. THE SAMPLES

Initial Sample

The 200 largest securities on the Chicago Research in Security Prices (CRSP) tape constitute the initial sample. Insiders' transactions for each

17. If the residuals of individual securities are normally distributed, the standardized residuals of eq. (4) will behave as if drawn from a t -distribution with 49 df. Equation (7), a weighted sum of these t -distributed variables, is t -distributed with degrees of freedom approximately equal to $49 n$ (see Kermit A. Brownlee, *Statistical Methods in Science and Engineering* [New York: John A. Wiley & Sons, 1965], pp. 297-304). The degrees of freedom are very large and a normal distribution will suffice. Plots of standardized residuals from samples to be presented later suggest that the individual residuals are indeed t -distributed with a variance of one.

of the 200 securities are observed in 5 separate months during the period from 1962 to 1968. The individual months of observation for a particular security are chosen in the following manner.

Five random numbers are selected, where each random number is a drawing from the set of integers from 12 to 18. The first month of observation on a security is designated by the first random number. Month 1 is defined as August 1961. As each random number ranges from 12 to 18, the first month of observation for a company is one of the months from July 1962 to January 1963. The second month of observation is designated by the sum of the first two random numbers, and the third month of observation is designated by the sum of the first three random numbers. The fourth and fifth months of observation are selected in a similar manner. Random numbers from 12 to 18 are chosen to separate the individual observations of a company by at least a year.

For example, if the five random integers of XYZ company are, respectively 13, 12, 14, 18, 14, insider trading of XYZ would be observed in month 13 (August 1962), month 25 (August 1963), month 39 (October 1964), month 57 (April 1966), and month 71 (June 1967). As the last month on the CRSP tape is June 1968, any observations beyond August 1967 are ignored.

In any month an individual trader is classified as a purchaser if the number of days during the month in which he buys stock is greater than the number of days in which he sells stock. Conversely, he is classified as a seller if the number of days in which he buys stock is less than the number of days in which he sells stock. If he purchases stock just as many times as he sells it, he is not included in the sample. Exercises of options are excluded from this and all other samples in this study because it is felt that options are exercised due to institutional factors rather than as a result of special information.

For each company in the initial sample, a month is classified as a month of net purchasers or a month of net sellers depending on whether the number of purchasers is greater or less than the number of sellers. Months during which the number of purchasers equals the number of sellers are excluded. Months of net purchasers and months of net sellers are defined as insider trading events. In this and all other samples in the study, events are excluded if companies are not listed on the CRSP tape for 50 months before the event and 10 months after the event. This restriction assures sufficient data to form portfolios and to calculate residual variances. There are 952 trades in the initial sample. Many companies have more than one trade in a month, so that the number of months of net purchasers plus the number of months of net sellers is only 362.

Sample of Large Transactions

While insiders may transact without special information, one might expect that their large transactions would more likely be based on inside

information. Thus, a sample of large transactions may contain less statistical noise than the original sample.

All transactions from the initial sample whose values are greater than \$20,000 are assembled into a subsample. This subsample contains 370 trades, representing 39 percent of the original sample of 952. The previous classification scheme is employed to separate months of net purchasers from months of net sellers.

Samples of Months of Intensive Trading

Since special information may lead to simultaneous purchases or to simultaneous sales by many insiders of the same company,¹⁸ the percentage of traders with information might be higher in these intensive trading periods than in other periods. In order to reduce statistical noise, samples of intensive trading firms are chosen.

Any company with at least Y more purchasers than sellers in a month is classified as an intensive buying company for that month. Conversely, any company with at least Y more sellers than purchasers in a month is classified as an intensive selling company for the month. In the following sample, Y will assume the value of three.

This sample includes all intensive trading companies listed on the CRSP tape during the months from April to October 1961; from December 1961 to November 1962; from January 1964 to March 1965; from May to December 1965; and from September 1966 to March 1967.¹⁹

V. RESULTS AND ANALYSIS

For each sample, table 3 presents the cumulative average residuals for the 1-, 2-, and 8-month holding periods following trading events. These three time intervals are chosen in order to study both the short-term and long-term predictive power of insiders. It also shows t -values and significance levels of these for the hypothesis that the expected values of the standardized residuals in equation (7) are zero. As an aid to understanding these findings, the following presentation for the initial sample gives additional detail.

Initial Sample

Figure 1 presents the cumulative average residuals from month -15 to month +15 for the initial sample. The procedure for estimating indi-

18. It is also possible that the monthly transactions of insiders are drawings from an underlying distribution of a process unrelated to future stock price movements, so that the unusual months arise from chance rather than from special information.

19. This sample is composed of the five samples used in Jeffrey F. Jaffe, "The Effect of Changes in Security Regulation on Insider Trading" (unpublished manuscript, Indiana University, 1973). In order to examine insider trading during periods with varying degrees of governmental regulation, the sample chosen is discontinuous.

Table 3

Cumulative Average Residuals and Significance Tests for Samples of Insider Trading, with Time Measured from Month of Trading Event

Length of Time Period (in Months)	Cumulative Average Residual	<i>t</i> -value	One-tailed Significance Level
Initial Sample (362 Observations)			
1 .....	.0060	1.93	.026
2 .....	.0118	2.24	.012
8 .....	.0136	1.32	.010
Sample of Large Transactions (204 Observations)			
1 .....	.0062	1.99	.023
2 .....	.0134	2.09	.018
8 .....	.0184	1.14	.126
Intensive Trading Sample of the 1960s (Y = 3, 861 Observations)			
1 .....	.0098	3.65	.0001
2 .....	.0209	4.73	<.00001
8 .....	.0507	5.23	<.00001
Intensive Trading Sample of the 1950s (Y = 4, 293 Observations)			
1 .....	.0094	3.06	.001
2 .....	.0174	3.16	.0008
8 .....	.0514	4.69	<.00001
Intensive Trading Sample of the 1950s (Y = 5, 157 Observations)			
1 .....	.0112	2.97	.001
2 .....	.0174	2.76	.003
8 .....	.0448	3.18	.007
Intensive Trading Sample of the 1950s (Y = 6, 80 Observations)			
1 .....	.0125	1.60	.055
2 .....	.0078	0.77	.227
8 .....	.036	1.05	.147

vidual and cumulative average residuals is given in Section III, above. Under those procedures, data for sales are added, with their signs changed, to data for purchases. Thus, the residuals shown in figure 1 rise when purchased stocks rise and when sold stocks decline.

The cumulative average residuals actually fall by approximately 2 percent in the 15 months prior to events. Cumulative average residuals rise approximately one-half of 1 percent in the 15 months following trading. The most rapid rise occurs in the first few months after trading, suggesting that insiders can forecast residuals in the near future better than residuals in the distant future.

In addition to estimating the magnitudes of residuals, this study employs the portfolio method to test whether these residuals differ significantly from zero at three different periods of time. The first part of

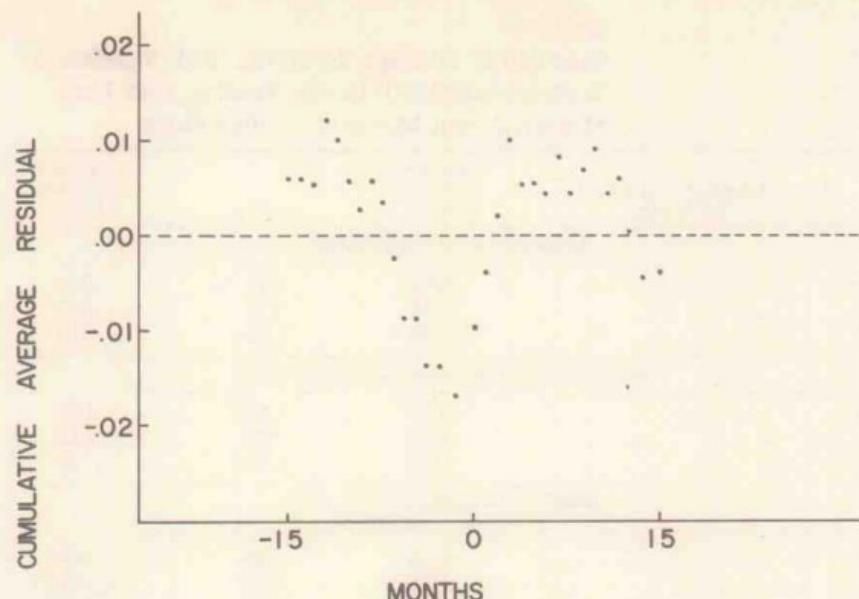


FIG. 1.—Cumulative average residuals for initial sample

table 3 gives the results from the portfolio method for the initial sample. The t -value corresponding to the hypothesis that the expected value of the standardized residuals in equation (7) equals zero, and the one-tailed significance level of that t -value, are shown for each value of X .²⁰ The t -values are statistically large; the smallest, 1.32 and the largest, 2.24. Though these results suggest that insiders do possess and exploit special information, other samples must be examined before more definite conclusions are formed.

Sample of Large Transactions

This subsample of the initial sample was designed to be less subject to various kinds of noise, etc. As the cumulative average residuals are nearly identical with those of the initial sample, the results do not suggest that large transactions contain more information than small transactions.

The second part of table 3 presents the t -values associated with the portfolio method for this subsample. The associated t -values remain statistically large and indicative of successful prediction.

Intensive Trading Samples

The first and largest of these samples is for the 1960s and uses only months in which there are at least three more sellers than purchasers ($Y = 3$). Average residuals are large, rising .0507 in 8 months. Similarly, the high t -values suggest that insiders trade successfully.

20. As each t -statistic has a large number of degrees of freedom (see n 18), the one-tailed significance levels are taken from a normal probability table.

As a check on these results, a sample of intensive trading companies from a different time period is selected. For this sample Y assumes the values of four, five, and six. All intensive trading months occurring during the period from January 1953 to December 1955 and January 1958 to December 1959 for companies listed on the CRSP tape are included in the sample.²¹ Where Y equals four, the cumulative average residuals again rise over 5 percent in 8 months, suggesting that insiders possess special information. The t -values are large: each of the three is greater than 3.0. For the samples where Y equals four and where Y equals five, the cumulative average residuals are of similar magnitude. The small sample size in the latter sample can explain the slightly lower t -values. When Y equals six, both the cumulative average residuals and the t -values are smaller. As this sample contains only 80 observations, the results are not as decisive as the results of the total sample.

The findings indicate successful trading by insiders. However, as the cumulative average residuals do not increase as Y increases, the results do not suggest that profit to insiders is an increasing function of the intensity of the trading. One might speculate that, as the number of insider traders increases, the nature of their information becomes increasingly similar to that of outsiders, either through leaks or from a common assessment of generally available information.

Inclusion of Transaction Costs

In order to determine the profits that insiders earn, transaction costs must be subtracted. This study assumes that transaction costs are 2 percent—1 percent brokerage charge for both a purchase and a subsequent sale (or a sale and a subsequent purchase). This is only approximate, as there are other costs and benefits. On the one hand, an insider must pay the specialist spread on his transaction. In addition, by concentrating his holdings in the stock of his own company, he may suffer a loss of utility due to underdiversification of his portfolio. On the other hand, since this study uses only monthly price data, insiders may reap undetectable profits from intramonth price movements. Finally, an insider who used his information to determine the timing of an appropriate one-way transaction would incur only a 1 percent transaction cost.

Measuring the magnitude of profit after transaction costs as defined above is simple in principle. Each cumulative average residual gross of transaction costs is 2.0 percent greater than the cumulative average residual net of transaction costs. Determining the proper t -statistic is more difficult, however. For any single trading event for a security, the portfolio method places that security into the portfolios associated with $X + 1$ successive months. This is equivalent to an insider buying a security in period t and selling it in period $t + X + 1$. Thus, for each event

21. This sample was collected for use in a preliminary draft of Jaffe. This sample is discontinuous as insider trading was observed in different periods with varying degrees of regulation.

Table 4
 Statistics on Profitability of Insider Trading
 after Transaction Costs

<i>Y</i>	8-Month Cumulative Average Residual after Transaction Costs	<i>t</i> -Value (<i>Y</i> = 7)	One-tailed Significance Level
3 .....	.0307	3.26	.0006
4 .....	.0304	2.92	.002
5 .....	.0248	1.84	.032

of a security, the 2.0 percent transaction costs must be allocated over ($X + 1$) months. For example, when X equals seven, the transaction costs for each event are charged off at a rate of 0.25 percent for a period of 8 months.

Of the many combinations of sampling period, holding period, and trading intensity covered in table 3, only the four intensive trading samples have any cumulative average residuals greater than 2.0 percent transaction costs. Thus, only these samples are investigated after the addition of transaction costs.

For this set of tests we ignore results where the time period is 1 or 2 months, as transaction costs overwhelm the gains from holding securities for a short length of time. Table 4 presents the results net of transaction costs. The *t*-values for 8-month periods are statistically large. Insiders earned approximately 3 percent profits in the 8 months after transactions, indicating that transaction costs have diminished profits by 40 percent.

Summary

This study has examined three different samples. Together, the data suggest that insiders possess special information. This conclusion follows not only from the significance of the results from the first intensive trading sample, but also from the similarity of results from the different samples. It reinforces the results of previous researchers who uncovered evidence of special information (see above). However, only the intensive trading samples yield profits greater than commissions.

The results tell nothing about the profitability of transactions not required to appear in the *Official Summary*. For example, leakage of information to friends and relatives who need not report their transactions to the Securities and Exchange Commission (SEC) and reciprocal passage of information between insiders of different companies may escape the detection of government regulators. There is little doubt that arrangement such as these occur. Henry Manne even suggests that the primary purpose of board-of-directors meetings is to abet this reciprocal passage of information.²² In addition, insiders may profit from information indirectly related to other companies, for example, if the insider

22. Manne, p. 65.

learns that his own company won an unexpected contract from a competitor, the insider might sell short the competitor's stock.

New developments in security regulation outlaw trading based on this passage of information. However, since only corporate insiders are required to report their transactions to the SEC, the detection of the trades of noninsiders can be expected to be difficult.

VI. INFORMATION CONTENT OF THE OFFICIAL SUMMARY

Introduction

The previous results, indicating that insiders earn profits on their own account, imply that the trades of insiders contain information. Unless the information is discounted prior to the distribution of the *Official Summary*, investors will be able to profit from the publication. This section deals with the information content of the *Official Summary*.

The information content of the publication is investigated by examining the residuals of securities subsequent to the publication in the *Official Summary* of insider trading events in these securities. Lorie and Niederhoffer state: "The Summary is compiled from month-end reports of insiders and is in print approximately five weeks after the last transaction. The basic data, however, are frequently filed by the insiders with the stock exchanges within a few days of the transaction. Regulations require that information be filed with the exchanges within ten days of the end of the month in which the trading takes place."²³ This study assumes that the *Official Summary* always publishes an insider trading event 2 months after the event occurred. For example, if a company has an event in June 1962, we assume that the event is published in August 1962. Consequently, residuals of the company are examined beginning in September 1962.

Profits Gross of Transaction Costs

Figure 1 presents the cumulative average residuals for the initial sample. Residuals after month +2 occur subsequent to the publication of insider trades. Cumulative average residuals do not rise between month +2 and month +15 in the initial sample, suggesting little if any long-term informational effect. As the average residual for month +3 is large, it appears that any information from the publication is discounted rapidly.

Other samples are investigated as well. For the samples described in Section IV, table 5 presents the *t*-values and the cumulative average residuals on data subsequent to the *Official Summary*'s publication dates. In each of the six samples, at least one of the three *t*-values is above 2.00, and all *t*-values are positive. In the first intensive trading sample, the *t*-values are extremely large, running from 2.53 to 4.77. There appears to be much informational content in the data; in the intensive trading

23. Lorie and Niederhoffer, p. 36.

Table 5

Cumulative Average Residuals and Significance Tests for Samples of Insider Trading, with Time Measured from Month of Publication of *Official Summary*

Length of Period (in Months)	Cumulative Average Residual	t-Value	One-tailed Significance Level
Initial Sample (362 Observations)			
1 .....	.0087	2.55	.005
2 .....	.0027	0.91	.184
8 .....	.0070	0.98	.164
Sample of Large Transactions (204 Observations)			
1 .....	.0098	2.23	.013
2 .....	.0134	1.67	.047
8 .....	.0184	1.36	.088
Intensive Trading Sample of 1960s (Y = 3, 861 Observations)			
1 .....	.00741	2.53	.006
2 .....	.01238	3.96	.00002
8 .....	.04936	4.77	<.00001
Intensive Trading Sample (Y = 4, 293 Observations)			
1 .....	.0010	0.281	.390
2 .....	.0065	1.80	.036
8 .....	.0412	3.71	.0001
Intensive Trading Sample (Y = 5, 157 Observations)			
1 .....	.00095	0.00045	.50
2 .....	.0098	1.307	.096
8 .....	.0408	2.47	.007
Intensive Trading Sample (Y = 6, 80 Observations)			
1 .....	.017	2.26	.012
2 .....	.0212	1.45	.073
8 .....	.0464	1.00	.159

samples where Y equals three and four, cumulative average residuals rise between 0.04 and 0.05 in the 8 months after publication of an event. As other samples show a less dramatic rise, the data suggest that the best trading schemes involve an examination of intensive trading companies. The cumulative average residuals after publication are only slightly lower than the cumulative average residuals presented in the first two sections of the paper. Thus, a large portion of the information contained in the trades of insiders is not discounted by the month of the publication of the trades.

Net of Transaction Costs

Since one must consider transaction costs in determining the value of the *Official Summary* to outsiders, this section examines the profitability of trading rules based on the *Official Summary* net of transaction costs.

Transaction costs are allocated to portfolios in the manner described in Section IV and are again set at 2 percent.

Table 6 presents the results of the portfolio method with the inclusion of transaction costs. Only the samples where Y equals three, Y equals four, and Y equals five are included, as commission charges are greater than cumulative average residuals in all other samples. Profits to outsiders after transaction costs are approximately 2-3 percent in these samples. Thus, transaction costs account for less than 50 percent of profits. The t -values for the samples where Y equals three and Y equals four are statistically large. As the sample where Y equals four is independent of the sample where Y equals three, the above suggests that investors can profit by prompt use of the *Official Summary's* information on intensive trading companies. Since transaction costs erased profits in all other samples, the results do not indicate any other profitable trading schemes.

Individuals desiring to invest excess funds would be interested in the informational content of the *Official Summary* gross of transaction costs, as they must pay these costs whether or not they use the publication. Thus they can use the publication's information on many different types of insider trading events profitably.

VII. CONCLUDING REMARKS

The present study attempts to resolve the conflicts in the results of previous papers by employing more powerful techniques and data sets. For all of the samples in the study, it was concluded that insiders do possess special information. However, after adjustment for transactions cost, only the intensive trading samples with 8-month holding periods were earning statistically large returns, with transaction costs accounting for approximately 40 percent of the gross profits in these samples. Results also indicate that much information contained in the trades remains undiscounted by the publication date in the *Official Summary*. Including transactions costs eliminated profits for outsiders in all but the intensive trading samples, where profits on the order of 2.5 percent could be earned.

Suggestions that corporate officials earn profits by trading on their

Table 6
Statistics on Net Profitability after Transaction
Costs of Insider Trades Subsequent to Their
Publication in the *Official Summary*

Sample	8-Month Cumulative Average Residual after Transaction Costs	t -Value ($X = 7$)	One-tailed Significance Level of t -Value
$Y = 3$ (from sample of 1960s) .....	.0294	2.78	.003
$Y = 4$ (from sample of 1950s) .....	.0208	1.92	.027
$Y = 5$ (from sample of 1950s) .....	.0208	1.09	.137

own accounts are of interest to the public officials and legal profession. First, the results indicating that trading on inside information is widespread suggest that insiders actually do violate security regulations. Second, the evidence of information in the intensive trading samples indicates where the law enforcers should search for violators.²⁴

The results of Section VI, as well as the Lorie and Niederhoffer study, indicate that the *Official Summary* contains information on future stock prices, a finding inconsistent with much of the research on efficient capital markets. Future research might investigate the causes behind the market's gradual adjustment to information contained in the publication.

The data suggest that the best of the trading rules based on information in the *Official Summary* involve an examination of intensive trading companies, as only these samples possessed residuals greater than the costs of transaction. Future research might further examine whether strategies based on intensive trading companies, as well as entirely new strategies, can consistently outperform a naive buy-and-hold strategy.

24. The effectiveness of security regulation is investigated in detail in Jaffe.

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